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52

M47 Patton

by Robert J. Icks Colonel AUS Retd.

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by Colonel Robert J. Icks

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U.S. M.47 Medium Tanks transferred to the Japanese defence force firing during manoeuvres in the Japanese countryside. (Armor)

M.47 Patton

by Robert J. Icks, Colonel A.U.S. retired

WORLD War II ended in 1945 and before the year was over, a War Department Equipment Board, informally called the Stilwell Board, outlined a five year programme for post-war military policy. Although General Omar Bradley had said: "What the ship is to the Navy; what the airplane is to the Air Force; the tank is to the Army", relatively little money was allocated to armour out of the reduced post-war appropriation monies. By 1946 there was general agreement, therefore, that such funds as were available should be used to develop new vehicle components.

The value of this approach had proved itself prior to World War II. The rubber bushed, rubber block track had been well tested. The shortage of natural rubber at the start of World War II had necessitated turning to synthetic rubber which caused many initial problems but the basic track design nevertheless had been found satisfactory. The volute spring suspension had been a well tested component and had performed well even when vehicle weights rose far above the weights they originally had been intended to support. Adoption for tank road or bogie wheels of the commercially available industrial wheel with solid rubber tyre was another pre-war standard component.

The lack of automotive industry interest in developing a satisfactory tank engine had been a blessing in disguise because the Ordnance Department had succeeded in utilizing air cooled radial aircraft type engines so that, in effect, they had become a standard component and for a time in World War II, they powered most of the tanks produced. However, the needs of the United States and her allies were tremendous. Before the war was over, the need for tanks became so great that five additional engine types had to be improvised, with all the attendant problems of production, supply, maintenance and training. The ideal tank engine had been foreseen in 1942 but was not to become a reality until after the war.

These pre-war standardized components had served their purpose. Now, with the acquisition of much combat knowledge from both allies and enemies, new components were needed. These would make possible the design of new tanks which then could be produced after policy and needs had crystallized and adequate funds might be available.

During 1946 the Tank Destroyer Command, the Armoured Command and the Cavalry were merged as the Armoured Cavalry because it was felt that tactical methods and objectives during World War II had been common to all three. The objectives insofar as vehicle design was concerned were to develop

Rear view of early M.47 tank showing location of engine exhaust mufflers, towing pintle, lifting eyes, blackout lights, three round inspection plates, and outside telephone box. (U.S. Ordnance Dept.)

The M.46 Medium Tank was the M.26 Pershing modified. Early M.47 tanks had modified M.46 hulls and chassis.

Three-quarter left rear view of the T.42 medium tank showing rangefinder turret, with pistol port and steel tracks with detachable pads.

components which would make possible the replacement of the World War II M.24 Light Tank, the M.4 A3 E8 Medium Tank and the M.26 Heavy Tank. In each class, emphasis was to be placed on lightness of weight consistent with the most powerful armament possible; parts standardization; reliability in extremes of temperature; simplicity of field maintenance in those extremes; and conservation of materials.

A start on this programme was made in the summer of 1946 when the Commanding General of Army Field Forces asked the Society of Automotive Engineers to send technical committees to three winter manoeuvre areas. A year later these engineers recommended development of an air cooled engine series with unit parts suitable for any combination of engines from one to 16 cylinders. A second recommendation was to eliminate conventional transmissions in favour of a torque converter type of drive. The type of transmission recommended already was available in the form of the Cross Drive. This device had been developed out of the experience gained with the hydramatic and torqmatic drives used on various standard and experimental vehicles during the later phases of World War II. By VJ-Day, in 1945, it already had been well tested. Credit for it was shared by Ordnance and General Motors engineers. The type of engine recommended was undertaken by Continental Motors in collaboration with Ordnance. A complete range of engines became available through the use of two basic cylinder barrels and with many other interchangeable parts.

The study of other desirable standard components also began. Among these were improved electric storage batteries, torsion bar suspension units, improved tank guns and recoil mechanisms, waterproof electrical harnesses and other electrical equipment, tracks, hydraulic devices, gun pointing mechanism, automatic loaders and others. These generally were undergoing study or had only reached the development stage in 1947 when the world situation began to deteriorate. Therefore a four year programme of rebuilding existing tanks began, undertaken principally with the M.26 Heavy Tank. At the same time, layouts of new designs began. The general public,

Side view of M.47 with diesel engine and 105 mm. gun made by OTO-Melara.

The M.47.R modified by OTO-Melara in Italy and offered commercially had a new diesel engine and new transmission and was armed with the British 105 mm. gun. (Photo courtesy OTO-Melara)

M.47 of U.S. Forces in Germany firing on a range, 1955. Compare this picture with that of the T.42 Medium. Note the three round inspection plates at the rear of the hull, characteristic of early M.47s which had modified M.46 hulls. Later hulls may not have these.

through reaction against war as well as through loose reporting, pseudo-science, wishful thinking and political playing on hopes, credulities and fear of atomic warfare, had been encouraged to believe that future wars would be pushbutton affairs handled by the Air Force, leaving the average citizen to live a free and untroubled life. The Berlin Airlift awoke them to the facts of life.

DEVELOPMENT OF THE M.47

A Panel on Armour was appointed in 1949. This group devised an integrated programme of tactics, organization and a proposed family of tanks to replace the corresponding tanks available at the end of World War II. The rebuilt M.26 Heavy Tank had become the M.46 or Patton Tank by the substitution of a new engine and transmission but was considered only an interim vehicle. The new designs were known respectively as the T.41 Light, the T.42 Medium and the T.43 Heavy Tanks, all to be equipped with the new engines and transmissions.

The M.26 or General Pershing originally had been numbered T.26 E3. This was under the changed application of the Ordnance numbering system which had become necessary during World War II to eliminate the previous confusing duplications of numbers but retaining the basic system. This had been the familiar "T" followed by an Arabic numeral for an experimental model and "M" similarly for a standardized vehicle, while a suffix "E" followed by an Arabic numeral represented an experimental modification and a suffix "A" with a numeral represented a standardized modification.

An M.26 Heavy Tank had been fitted with a new 90 mm. gun, becoming the M.26 E1. Another was fitted with a new engine and transmission and became the M.26 E2 very briefly and then, with some additional modifications, became the T.40 Medium Tank. This vehicle became the basis for the rebuilding programme on the M.26 Heavy Tanks. These, after rebuild, to become the M.46 Medium or General Patton Tanks.

In 1950, a Reorganisation Act changed the Armoured Cavalry to Armour but, as with the Armoured Cavalry, without a Chief of Branch. As a matter of fact, none has existed to this day. The Korean War had begun in June 1950 but the T.42 Medium Tank design, which was to have become the standard post-war medium tank, was not quite completed at the time the war began. One of the T.42 turrets was mounted on an M.46 tank to become first, the M.46 E1, and then, because it was a marked improvement, became the limited standard M.46 A1. When the T.42 was completed, it had a five bogie wheel chassis with three support rollers. The tracks were detachable pad chevron type. Final drive was in the rear. There was an exhaust muffler over the tracks on each side. The travel lock for holding down the 90 mm. gun was offset to the left rear of the hull, which resulted in the gun being carried at a slight diagonal instead of the conventional method of pointing directly to the rear.

The 90 mm. gun forming the main armament was fitted with a bore evacuator but no muzzle brake. The turret was slightly elliptical with a long bustle or rear turret bulge which acted as a counterweight to the gun. At the end of the bustle there was a stowage box. No stowage rails appeared on the turret sides but there were loops for tying down a camouflage net. The turret included a rangefinder, the "ears" of which protruded in the form of stubby cylinders. Pistol ports were in the turret sides.

Various modifications were made for experimental reasons. One of these was the installation of "fender kits". Fender kits were self-contained armoured boxes mounting a M1919A4 ·30 calibre Browning tank machine-gun, 680 rounds of ammunition, a pneumatic charger, a firing solenoid and an air supply. These fender-machine guns were fired by the tank driver.

M.47 tank fitted with T.15 flotation device operating in a calm sea, showing the two engine ventilation snorkels for rougher seas.
(U.S. Ordnance Dept.)

An M.47 tank with turret reversed and fitted with the experimental anti-aircraft cradle mount with handholds for the ·50 calibre gun.
(Courtesy: S. L. Sola)

A trainload of the first M.47 Medium Tanks in Germany on their way to U.S. Forces in Berlin. (United Press)

They were mounted, one at the front of each fender or mudguard.

The needs of the Korean War were such that existing vehicles had to be used, so the T.42 was never produced as a standardized vehicle. The turret, however, was such an advance that it was decided to produce a composite tank with this turret and to standardize it without going through the process of testing. This was the M.47. It was issued to U.S. Regular Army units in the United States and later to some National Guard units. But, at the same time that the M.47 was being produced, another design was in the making. The shape of the M.47 turret served as the inspiration for the hull as well as the turret of the newer design, known as the T.48. The M.47 was considered to be an interim design and as the T.48 (later standardized as M.48) tanks became available, the M.47s were replaced.

After the Soviet Union rearmed East Germany in violation of earlier agreements, the Western Powers decided to permit and then assist West Germany to rearm. The M.47s being available in quantity, they were the first armoured vehicles furnished to West Germany. Other nations later received them. They included Austria, Belgium, China (Taiwan), France, Greece, India, Iran, Israel, Italy, Japan, Jordan, Netherlands, Pakistan, Portugal, Saudi Arabia, South Korea, South Vietnam, Spain, Switzerland, Turkey and Yugoslavia.

PRODUCTION

The Congress of the United States became disturbed over the apparently poor showing made by American tanks at the start of the Korean War and the apparently good showing made by the Russian armour used by the invading North Koreans. Congressman Philbin headed a subcommittee appointed to investigate the tank situation. The subcommittee found what it called "a deplorable situation" and its recommendations led to President Truman ordering the institution of a new $500 million tank procurement programme.

Because of the well known "lead time" or length of time it takes to get into production, certain steps were taken to shorten this time. Some compromises were made in the design. The T.42 of course had been the ideal tank and had the Korean War not intervened, it is likely that it would have been produced as the M.47. Instead, the decision was made to utilize existing vehicles to some extent and to phase in additional changes as the other items could be produced without getting too far from the already existing M.46 A1 design which it was felt would take the least time to produce. The T.42 hull had been made up of flat plates. The M.46 hull was better ballistically, at least in front. The T.42 turret was put into production. The M.46 hull and chassis was modified and the two were married. Thus this tank was considered an emergency vehicle created out of existing components but even with the short cuts taken, the vehicle never became available for use in Korea.

It was a design which was put together without test and as could be expected, many "bugs" developed. Ordnance refused to accept the tanks until they could be classed as serviceable and considerable time elapsed until the necessary testing which should have been done first was done after production and the necessary corrections were made by the two producers, the Detroit Tank Arsenal and the American Locomotive Company.

The number of M.47 tanks produced between the two plants has not been determined. Their average cost was approximately $129,000 each, but it must be remembered that some chassis were furnished for

M.47 Medium Tanks in an Italian Army military parade, all but the co-driver's hatch open, showing tool boxes over fenders.
(*Foto Missinato*: Courtesy F. Wiener)

Prototype of the T.48 Medium Tank, showing the ellipsoid turret and hull, which grew out of the M.47 design. (Courtesy Chrysler Corporation)

rework and this average cost therefore does not represent a true cost.

DESCRIPTION

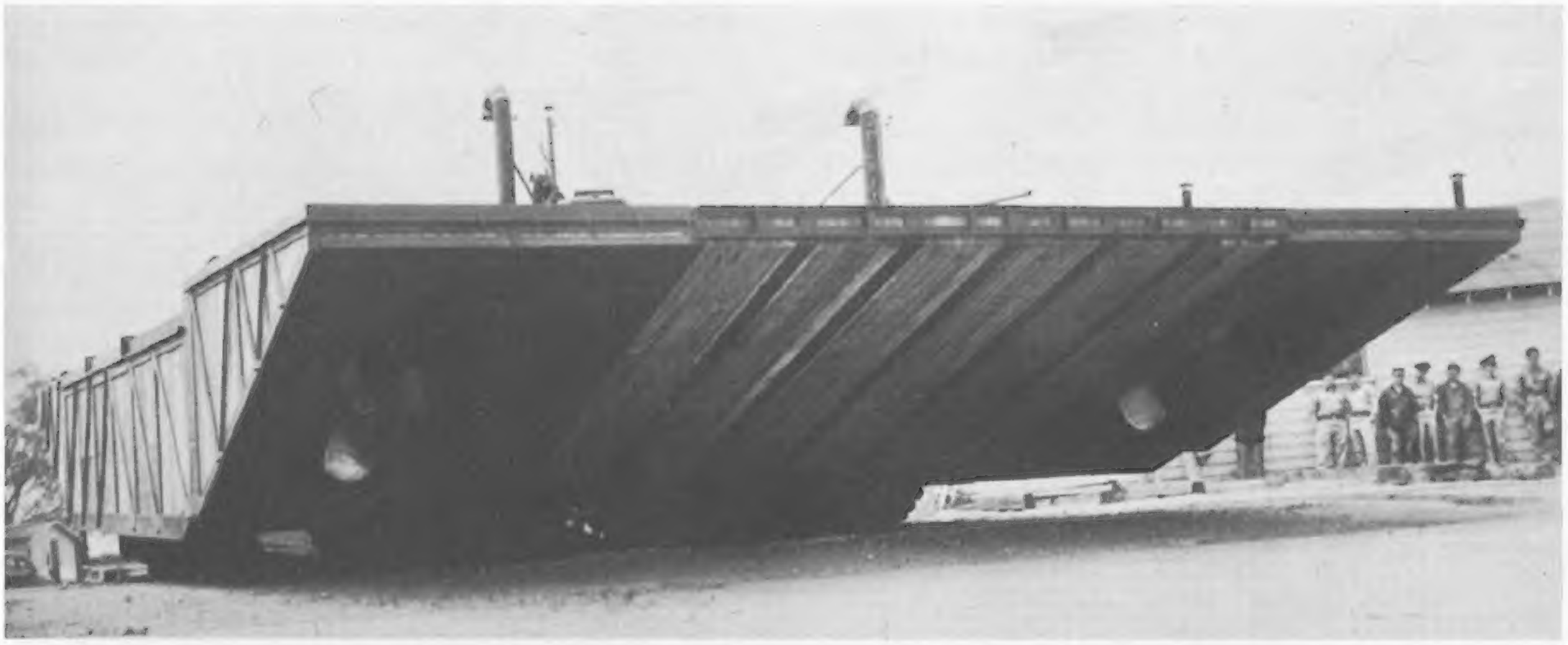
The M.47 is easily identified by the sharply tapered turret with small gun shield and particularly by the long narrow turret bulge ending in a stowage box. It also has the two covered engine exhaust mufflers, one over each track. The hull and the main armament and fire control equipment may have visible differences however between vehicles. Internally there were other variations.

The early M.47 tanks were modified M.46 hulls and chassis with the cast T.42 turret. These showed the characteristic three round inspection plates at the rear of the hull. Later hulls made specifically for the M.47 and introduced in production may not have these.

The hull was made up of flat welded armour plate and cast sections welded. Underneath were the transverse torsion bars and anchors. Towing shackles, lifting eyes and towing pintle were like those on other U.S. tanks. Inside the hull, a transverse bulkhead separated the crew compartment in front from the engine compartment in the rear. The hatches for the driver on the left and the co-driver on the right swung upwards and outwards. A round escape hatch was to be found at the forward end on each side just in front of the driver and the co-driver. Grill louvres covered the rear deck. The turret was elliptical in shape with a long bustle. The original pistol ports were eliminated in production as were the camouflage loops. Instead, there were two parallel rows of three stowage brackets on either side and later production vehicles had two parallel rows of continuous stowage brackets or rails. The commander's cupola on the right turret top had a hatch which was used by the commander and gunner for entering and leaving the vehicle while the loader had an oval-shaped hatch on the left top side. At the rear there was a small cover over an electric ventilating fan. The commander's cupola had five direct vision prisms in addition to a periscope facing forward. The loader and commander had fold-up seats while the gunner's seat was form-fitting and with a padded back. The two drivers also had form-fitting seats with padded backs. Three ten pound carbon dioxide fire extinguishers were located between and to the rear of the two drivers' seats, connected by tubing to the engine compartment. They could be controlled from the crew compartment or by the remote control handle outside the tank. This was located on the top of the hull behind the co-driver's hatch and was protected by a small metal hood. Two five pound portable carbon dioxide fire extinguishers were provided for the crew compartment.

There were manually operated drain valves in the bottom of the hull. There also were two electric bilge pumps, one in the engine compartment and one in the crew compartment. They have a rather amusing origin. The designer saw no need, after test, for a bilge pump in view of the drain valves provided and recommended that the single bilge pump be eliminated in the interests of simplicity. Instead of concurring in the recommendation, the using service demanded two bilge pumps and the M.47 was so equipped.

Service and blackout lights were provided on the outside. On the inside there were dome lights in the front of the hull and in the turret. Both had red as well as white lenses. And, like all American tanks, the interiors were painted white. The exterior was the standard olive drab or olive green. Inside and outside stowage were of the common types.



Rear view of T.15 flotation device fitted to an M.47 tank showing the two 36-inch screws and both engine ventilation snorkels.
(Courtesy Angersoll Products Div., Borg-Warner Corporation)

Radios were provided as needed and the interior was fitted so that crew members could plug in their interphones. There was a telephone in a box at the rear of the hull, complete with 40 feet of cable. It was intended for infantry communication with the tank crew, for artillery observation of indirect fire, for a crew member acting as a guide or for inter-connection with the tank radios for communication via radio for the use of infantry or artillery personnel outside the tank.

ARMAMENT

The main armament was a 90 mm. gun mounted in the revolving turret. Again, not all the weapons were exactly alike. Some had the M.36 gun and the flaring muzzle brake as used on the M.46 tank. Some had a different gun with the T-head blast deflector and some had the cylinder type blast deflector. All had bore evacuators. Originally, there was, co-axial with the main armament, a ·50 calibre Browning machine-gun, but later the standard ·30 calibre Browning machine-gun was substituted. Both were fed through ammunition chutes and an electric booster motor. There was a ·50 calibre Browning machine-gun on a rotating ring on the commander's hatch but this was later replaced by a ·50 calibre machine-gun on a fixed pintle mount. Both were free aiming weapons. A ·30 calibre Browning machine-gun with a depression of —10° and an elevation of +24° was located in the right glacis. It was tracer aimed by the co-driver through his hatch cover periscope.

M.47 Medium Tanks with cylindrical blast deflectors appearing in a military parade in Madrid in May 1967. (Courtesy J. W. Loop)

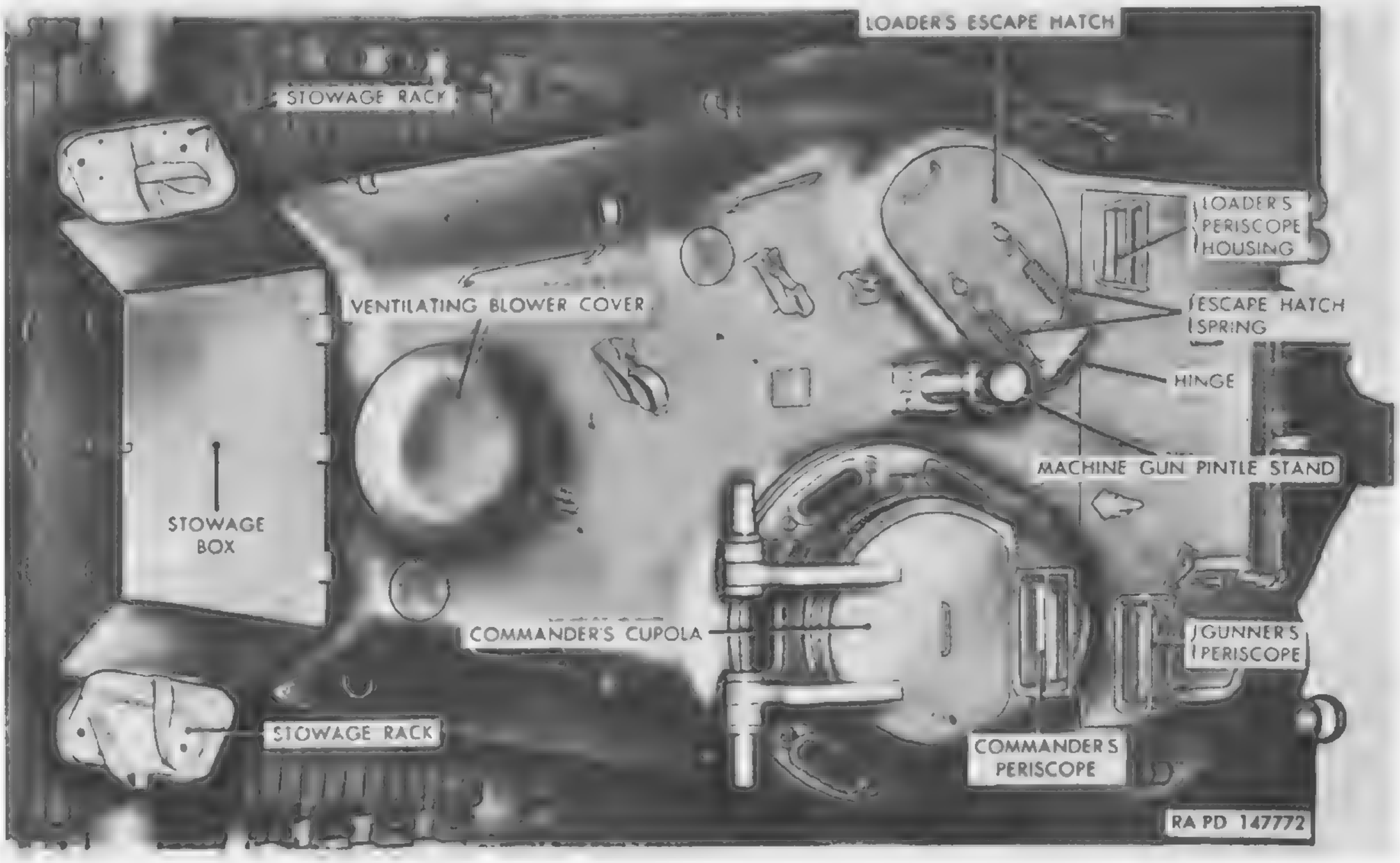
M.47 tank crew with stowage. (Col. Icks)

0 1 2 3

90mm Gun Full Tracked Combat Tank M.47

An M.47 Medium Tank with T-head blast deflector, in a military parade in Madrid in May 1967. (Courtesy J. W. Loop)

Top view of M.47 turret. Note its sharply tapered shape and long narrow bulge ending in a stowage box.



The 90 mm. gun had a vertical sliding breech block. It was semi-automatic in that the breech closed when a round was pushed home. It opened on recoil to eject the spent case and remained open for the next round. It was fired by an inertia type percussion mechanism actuated either by electric solenoid or manually. Similar firing mechanisms were provided for the co-axial machine-gun. The gun was mounted in a concentric hydro-spring combination gun mount permitting a recoil of 12 to 14 in. It had a depression of —5° and an elevation of +19° with elevation and depression limit switches. Hydraulic and manual elevating and traversing controls were provided for the gunner. The commander's aiming periscope was the same as the gunner's and he also was provided with override controls so that he could control and fire the weapons. It took ten seconds to rotate the turret through 360°.

The M.47 tank was equipped for both direct and indirect fire. The later models had a T41 range finder of 7·5 power and a super elevation transmitter T13 (M22) for direct fire. Early as well as late models had a periscope T35 (M20) and a ballistic drive T23E1 (M3) which could be used for direct or indirect fire. Thus it can be seen that some M.47 tanks did not originally have a range finder, another one of the confusing variations in this "standardized tank".

The ballistic drive applied an elevation correction to the angle of sight, depending on the range and type of ammunition used. A connector connected the T35 periscope to the gun linkage but when the tank was equipped with a range finder and it was used, the connector was removed and stowed. For indirect fire, the elevation quadrant T21 which was connected to the ballistic drive, was used. There also was an azimuth indicator T24 mounted on the right forward part of the turret and used in indirect fire. When a tank was equipped with a range finder, as the gunner operated the range knob on the range finder to maintain the target image, the super elevation transmitter automatically elevated or depressed the gun. An engraved ballistic correction plate was provided which showed the required correction for the muzzle velocity of the particular ammunition, for air density, air temperature and a rear wind, which then could be set by a correction knob on the range finder.

Ammunition, both fused and unfused, was the same as for the earlier M3A1 gun. The various rounds differed in weight, with projectile weights varying from 12·2 lb. to 29·24 lb. Eleven ready rounds were in racks in the turret basket. The remaining 60 were in the floor, together with the extra machine-gun ammunition.

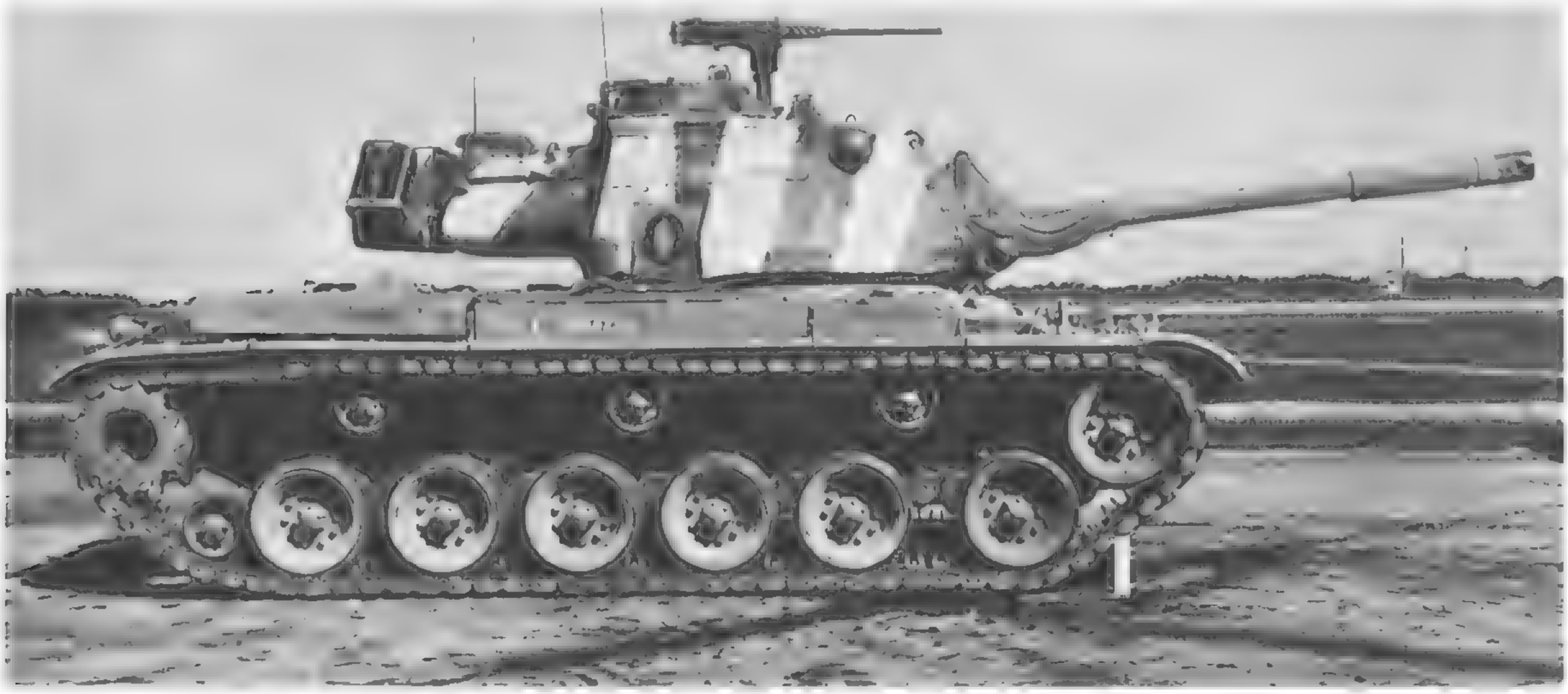
POWER PLANT

The engine was a Continental 12 cylinder, 4 cycle, 90° V-type, air cooled engine, one of those developed around the common parts concept. It was known as Model AV-1790-5B with a compression ratio of 6·5 to 1. Again, later vehicles had later model engines. All were overhead valve type with a single overhead camshaft for each bank of six cylinders. The cylinders were individually replaceable. Two carburettors were used, one for each bank, as well as two fuel pumps. There were four magnetos, two for each bank to supply dual ignition to each cylinder. A waterproof ignition harness connected the two magnetos to the 12 spark plugs on each side of the engine, all shielded to prevent radio interference.

Two mechanically driven horizontal fans were located flat on top of the engine, the accessory end of which was towards the front. The engine, oil coolers and transmission formed one unit for installation or removal. Idling speed was 650 r.p.m. Maximum governed speed at full load was 2,800 r.p.m. at which speed 810 h.p. was developed.

One of the most interesting features of this tank as well as of the companion T.41 (M.41) and T.43 (M.103) tanks was the cross drive transmission which allowed a tank to be driven as easily as an automobile. It was a final drive mechanism which incorporated an

M.47 Medium Tank showing suspension details, characteristic turret bustle and original type of welded-on turret stowage brackets.
(U.S. Ordnance Dept.)



Front view of early M.47 Medium Tank without rangefinder or bow machine-gun, with driver and co-driver hatches closed and equipped with steel grouser tracks (U.S. Ordnance Dept.)

automatic transmission and a method of steering into the final drive itself. The complete power pack with the 12 cylinder engine actually was shorter than the installation of the previously used 8 cylinder engine with differential drive would have been.

There was no clutch pedal but only a foot throttle and a service brake pedal. Control was through a single small hand lever located between the driver and the co-driver. Some of the early production vehicles had a duplicate control on the right of the co-driver, another variation in detail. There also was a hand throttle. By means of a hand grip and a finger lift trigger on the control lever, four shift positions were possible: neutral, low, high and reverse. Turns were accomplished by tilting the lever to right or left. Shifting from high range to reverse could be made without stopping and without danger of stripping gears. It was forbidden because of other strains which would be produced, but it literally was possible to spin the tracks by this means. At any rate, driving could be done with one hand, leaving the other hand free to adjust the periscope which often was necessary when driving with hatches battened down.

Radius of turn was dependent on tank speed. The slower the speed, the sharper the turn. At a standstill, the vehicle could be made to pivot on the spot, the mechanical drive output increasing on the outer side of the turning path. Torque increased as vehicle speed decreased so that in climbing a slope it was unnecessary to shift into low range. It actually seldom was necessary to use low range but it was very useful in descending steep slopes.

In operation, the engine power was delivered to the output flanges in part mechanically and in part hydraulically, through a converter. The converter output had five ranges of one to five times input torque, which ratio changed automatically in infinite steps depending on the driven load, making it impossible to stall the engine. At low range full throttle, 50 per cent of the power was delivered mechanically and 50 per cent hydraulically. As speed increased, the percentage of power delivered hydraulically increased while that delivered mechanically decreased. At high speed, the conversion to fluid flywheel was complete.

The wet, multiple disc steering brakes had a great deal of braking area yet they were small and com-

pletely enclosed in the mechanism. The final drives were drums or hubs with two track guides in the centre and a removable sprocket plate on either side of the hub on each side. The bogie or road wheels and the track support rollers were grooved in the centre also to act as guides. Volute type bumper springs limited bogie wheel travel. Hydraulic shock absorbers were used on all but the two centre bogie wheels. A smaller compensating idler wheel, which was torsion bar sprung, was located just ahead of the drive sprockets. Its purpose was to maintain track tension. The track normally used was the T80E6 steel grouser rubber backed track or the T84E1 rubber chevron track. Each was 23 in. wide and had a 6 in. pitch. There were 86 track shoes per side.

MARKS AND HYBRIDS

As occurred with earlier vehicles as well as with the predecessor T.42, the installation of fender kits also was tested on the M.47. Their accuracy, however, was unsatisfactory for fire at specific targets because of vehicle pitching but it had been thought they might be of use for area fire. Nevertheless, they were removed and efforts were turned towards the development of a satisfactory commander's cupola permitting observation and fire on terrestrial as well as aerial targets. In fact, one of the reasons given for not fully accepting the M.47 tanks after they were produced and for continuing the search for a still better medium tank in the form of the T.48 was the need for such a dual purpose cupola.

One of the devices tried on the M.47 was an

An M.47 tank negotiating rough ground during manoeuvres in Yugoslavia, that country also receiving U.S. military aid

experimental cradle mounted anti-aircraft machine-gun to replace the original rotating mount but it was considered too fragile and was not adopted.

Relatively few experimental modifications took place as compared with so many U.S. tanks. Among them was the General Electric Orion project, a two-stroke diesel engine with turbo blower. This was abandoned before completion several years later after a similar development of the Continental engine showed promise. Deep water fording kits, of course,

West German M.47 tank with engine compartment modifications necessitated by installation of a Daimler-Benz MB 837a 600 h.p. 8-cylinder multi-fuel engine. (Courtesy W. J. Spielberger)

An M.47 tank equipped with British Aircraft Corporation Swingfire missile projectors being shown at Farnborough Air Show in 1967.
(B. H. Vanderveen)

M.47 with mock-ups of BAC Swingfire anti-tank missiles.

were devised, and a flotation device also was constructed but was not standardized. There was also a T66 Mechanized Flamethrower. This was a standard M.47 with a long tube housing an E25-30 experimental flamethrower and was almost indistinguishable from the parent vehicle.

The West German forces, which had been the first foreign army to receive these vehicles, also received M.48 tanks when those became available. The M.47 tanks then were used experimentally to develop data for use in German designed tanks, experiments which later were of considerable value in developing the Leopard and Jagdkanone vehicles. Among the experiments was a change in the M.47 to place the driver on the right, eliminating the co-driver and thus reducing the crew to four. The space previously occupied by the driver was utilized for stowing 34 additional rounds of 90 mm. ammunition, making the total 105, instead of 71.

Another West German experiment was the installation of a Daimler Benz MB837 a 600 h.p. 8-cylinder multi-fuel engine. This necessitated a complete rebuild of the previous engine compartment. After the M.48 tanks were obtained, many of the 90 mm. guns from the M.47s were removed and became the main armament of the current Jagdkanonen.

The French equipped some of their M.47s with IR/White light projectors and later an experimental 105 mm. gun was mounted on an M.47. In 1969 the French offered commercially their surplus M.47 tanks armed with the same 105 mm. gun with telescoping magnesium thermal jacket as mounted on the AMX 30.

The Italian firm of OTO-Melara offered surplus Italian M.47 tanks modified to substitute the British 105 mm. gun and a new Italian diesel engine and a new transmission.

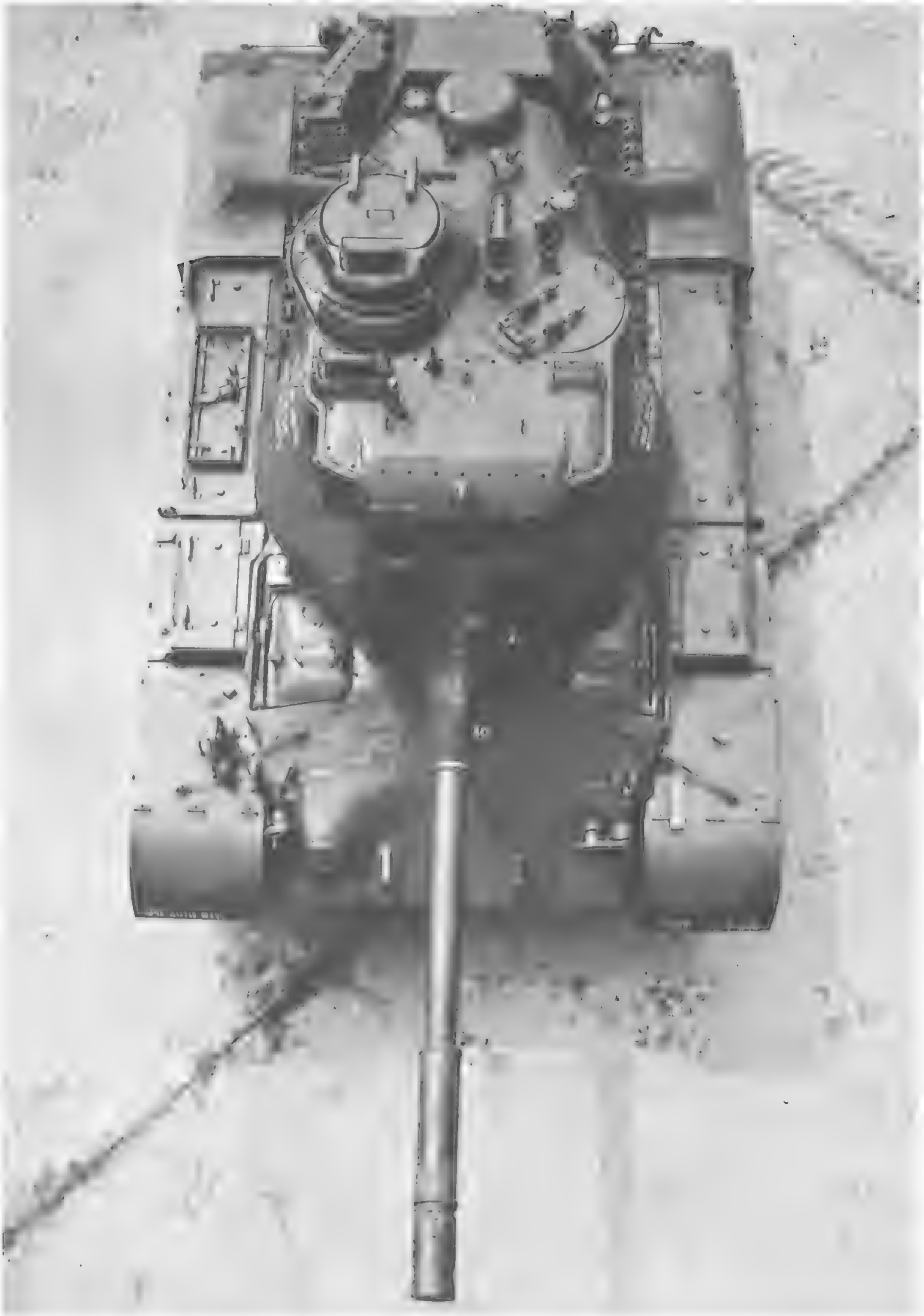
In 1970 it was learnt that Austria had made an experimental substitution of an M.60 A1 engine in one of their M.47 tanks, with the intention that if tests were successful more would be modified. The installation involved raising and modifying the rear deck.

The Japanese used some M.47s for a time but they were not satisfactory. Like most American tanks, they were not designed for the smaller average stature of the Japanese soldier. However, the Mitsubishi firm, using the M.47 as a model, designed a series of similar vehicles, the STA-1, STA-2, STA-3 and STA-4. The last named was standardized and adopted for the Japanese Defence Force as Type 61. The main weapon appears to have been taken from these earlier American vehicles.

Finally, at the Farnborough Air Show in England

M.46 E1 (M.46 A1) Medium Tank with T.42 tank turret, M.46 Medium Tank gun, new ignition harness, fire extinguishers and brake control
(U.S. Ordnance Dept.)

Top view of early M.47 without rangefinder or bow machine-gun.



U.S. M.47 of the Jordanian Royal Armoured Corps, March 1960. (Imperial War Museum)

in 1967, the M.47 was shown fitted with a British Aircraft Corporation Swingfire installation on the turret. From all this it is obvious that this tank is far from obsolete.

TACTICAL EMPLOYMENT

The organization of armoured forces in the United States Army has undergone many changes since the beginning of armoured vehicles and especially since it has become an accepted view that nuclear weapons would be used in future combat. Because of this, tactics too have varied in the various periods. Generally, armour employment varies between the light, medium and heavy types. Since the M.47 was in what today would be called a main battle tank class, such vehicles could be involved in meeting engagements, in a delaying action, in attack, in exploitation and in defence. Since tanks are offensive weapons, they normally would be employed in defence as a mobile striking force although sometimes they would be deployed as dug-in artillery.

The operation of tanks in general follows the tactics of conventional military units, which are fire and manoeuvre. In these, proper reconnaissance, proper use of terrain, the principles of mass and mobility, proper combat formations, teamwork and proper consideration for maintenance and repair, all are important. But there is another ingredient. Colonel Paul A. Disney, in his *Tactical Problems for Armour Units*, adds: "It has been aptly stated, and verified by combat experience, that casualties are in direct proportion to the time it takes troops to close on the objective. . . . All individuals, particularly commanders, must develop the ability to think and act quickly." The tank, by itself, is but an agglomeration of metal parts. It is the skill and morale of its crew which make it an effective military weapon.

AFV/Weapons Series Editor:
DUNCAN CROW

SPECIFICATION: M.47 PATTON

General
Designation: 90 mm. Gun Full Tracked Combat Tank M.47.
Crew: 5—Driver, Co-driver, Gunner, Loader, Commander.
Battle weight: 50·89 short tons (early production vehicles 48·6 short tons).
Dry weight: 46·44 short tons (early production vehicles somewhat less).
Power/weight ratio: 15·9 h.p./short ton.
Ground pressure: 13·7 lb./sq. in.

Dimensions
Length overall gun front: 27 ft. 11 in. with original gun.
Length overall gun rear: 23 ft. $3\frac{3}{16}$ in. with original gun.
Hull length overall: 20 ft. $8\frac{5}{16}$ in.
Height w/o machine-gun: 9 ft. $8\frac{3}{16}$ in.
Height overall: 10 ft. 11 in.
Width over tracks: 11 ft. 1 in.
Width overall: 11 ft. $6\frac{1}{2}$ in.
Track centres: 9 ft. 2 in.
Track base: 12 ft. $8\frac{1}{8}$ in
Track width: 23 in. for steel rubber backed T.80 E6, T.84 E1 rubber block, T.84 E2 rubber chevron.
Track width: 24 in. for steel with detachable Pads T.99.
Track pitch: 6 in. except for T.99 which is $6\frac{1}{2}$ in.

Armament
Main Armament: Turret mounted 90 mm. T.119 L40.9 gun in M.78 mount originally, later T.119 E1 (M.36) L/43 with flared muzzle brake. Some upgunned to T.139 (M.41) L/48 with T-head or cylinder head blast deflector.
Auxiliary armament: Co-axial ·50 calibre Browning M2 machine-gun originally, later ·30 calibre Browning M1919A4E1.
·50 calibre Browning M2 on revolving turret hatch originally, later pintle mounted.
·30 calibre Browning M1919A4 bowgun originally, later M1919A4E1.

Fire Control
Early models with Periscope T.35 (M.20), Azimuth Indicator T.24 (M.31) and Ballistic Drive T.23 E1 (M.3).
Later models with above plus T.23 E1 Ballistic Drive (later with M.3), T.41 Rangefinder (later with T.41 E3 (M.12) and Super-elevation transmitter (M.22) T.13).
All with manual and power elevating and traversing equipment.

Ammunition
71 rounds of 90 mm. ammunition, the mix varying with the mission.
3440 rounds of ·50 calibre tracer ammunition originally, later 11,500 rounds
Types of 90 mm. ammunition:
AP-T: Armour piercing tracer, solid shot.
APC-T: Armour piercing capped tracer, with bursting charge, delayed fuse.
HVAP-T: Hyper velocity armour piercing with tracer, lightweight body, dense core.
HVAP-DS-T: Hyper velocity armour piercing discarding sabot steel shell carrying cup or sabot, dense core.
HE or HE-T: High explosive without or with tracer, various fuse types.
HEAT: High explosive anti-tank shaped charge.
Marker: (Green, red or yellow) Fused.
WP or WP-T: White phosphorus smoke without or with tracer.
TP: Target practice inert.
HVTP-T: Hyper velocity target practice with tracer.
Blank: For ceremonials.
Drill: Inert.

Sighting and Vision
M.6 (metal body), M.13 or M.13 B1 (plastic body) vision periscopes originally, later M.13, M.19 and M.20 AB. T.35 commander's and gunner's sighting periscopes.

Communications
Intercom and AN/GRC-3, 4, 5, 6, 7 or 8 radios and AN/VIA-1 or AN/VRC-47 telephone

Armour
Welded homogeneous armour plate and homogeneous castings. Thickness in mm. and degrees inclination:
Hull: Upper front 100 mm. at 60°; Lower front 75 mm. at 53°; Sides 75 mm. at 75°; Top 22 mm.; Rear 50 mm. at 10°.
Turret: Shield 115 mm.; Front 100 mm. at 40°; Sides 65 mm. at 30°; Top 25 mm.; Rear 50 mm. at 3°.

Engine
Continental AV-1790-5, 5B, 7 or 7B petrol (80 octane). 6·5:1 compression ratio. V-12 4 cycle valve in head, capacity 1,791·75 cu. in. 810 h.p. at 2,800 r.p.m. 233 U.S. gallons beside engine compartment.

Transmission
Allison CD 850-4, 4A or 4B Cross Drive, 2F1R, combining Torque converter and steering mechanism.

Suspension
Torsion bar, 6 bogie wheels, 3 support rollers per side, rubber tyred, rear track tension bogie wheel.
Steel and rubber block tracks, steel track pins rubber bushed, double pins per shoe, 86 shoes per track.

Electrical System
24 volt, magneto ignition, Wisconsin 150 ampere Model TFT, 2 cylinder 4 cycle auxiliary generator.

Performance
Max. governed speed: 37 m.p.h.
Slope: 60 per cent.
Vertical obstacle: 3 ft. 3 in.
Trench: 8 ft. 6 in.
Wading depth unprepared: 4 ft. 0 in. Floats with proper equipment prepared: 8 ft. 0 in.
Range: 100 miles. 0·4 m.p.g. (U.S.)

Special Features
Equipped with towing pintle; dozer blade can be added.

M.47 with fender kits mounted on the front track guards. These armoured boxes each contained a ·30 cal. machine-gun, ammunition, pneumatic charger, firing solenoid and air supply. The driver controlled the guns. (U.S. Official)

AFV/Weapons Profiles

Edited by DUNCAN CROW

FORTHCOMING TITLES:

45 Vickers Main Battle Tank
(publication delayed).

53 FV432
by Christopher F. Foss
The British Army's APC developed from the earlier FV420 series, originally called Trojan. The FV432 is used by most arms of the British Army in one role or another and will remain in service for some years to come as no replacement has yet been announced.

54 Japanese Combat Cars, Light Tanks and Tankettes
by Lieut.-General Tomio Hara

Describes the Sumida armoured truck of 1928, the amphibious half-track of 1930, the Type 92 Heavy Combat Car (which "paved the path to many epoch making tank technologies"), the railroad armoured tractors, the Type 95 and Type 98 Light Tanks and their modified versions, and the Type 94 and Type 97 Tankettes. Written by the man who played a prominent part in Japanese tank design, this *Profile* corrects many of the designation errors and false ideas about the concepts behind the development which are prevalent in the few Western writings on pre-1945 Japanese AFVs.

FUTURE TITLES WILL INCLUDE:

Elefant and Maus (+E-100)
by Walter Spielberger and John Milsom
Elefant was the conversion of the original Porsche Tiger tank design into a self-propelled tank destroyer. "It turned out to be a technically most complicated and unreliable vehicle. This is said despite the fact that your author was engaged as design engineer on this project and that he participated actively in the action in Russia described at the beginning of this *Profile*."
Maus the largest armoured fighting vehicle ever built, was the culmination of Porsche technical development in the Tiger field. E-100 was the Maus's rival.

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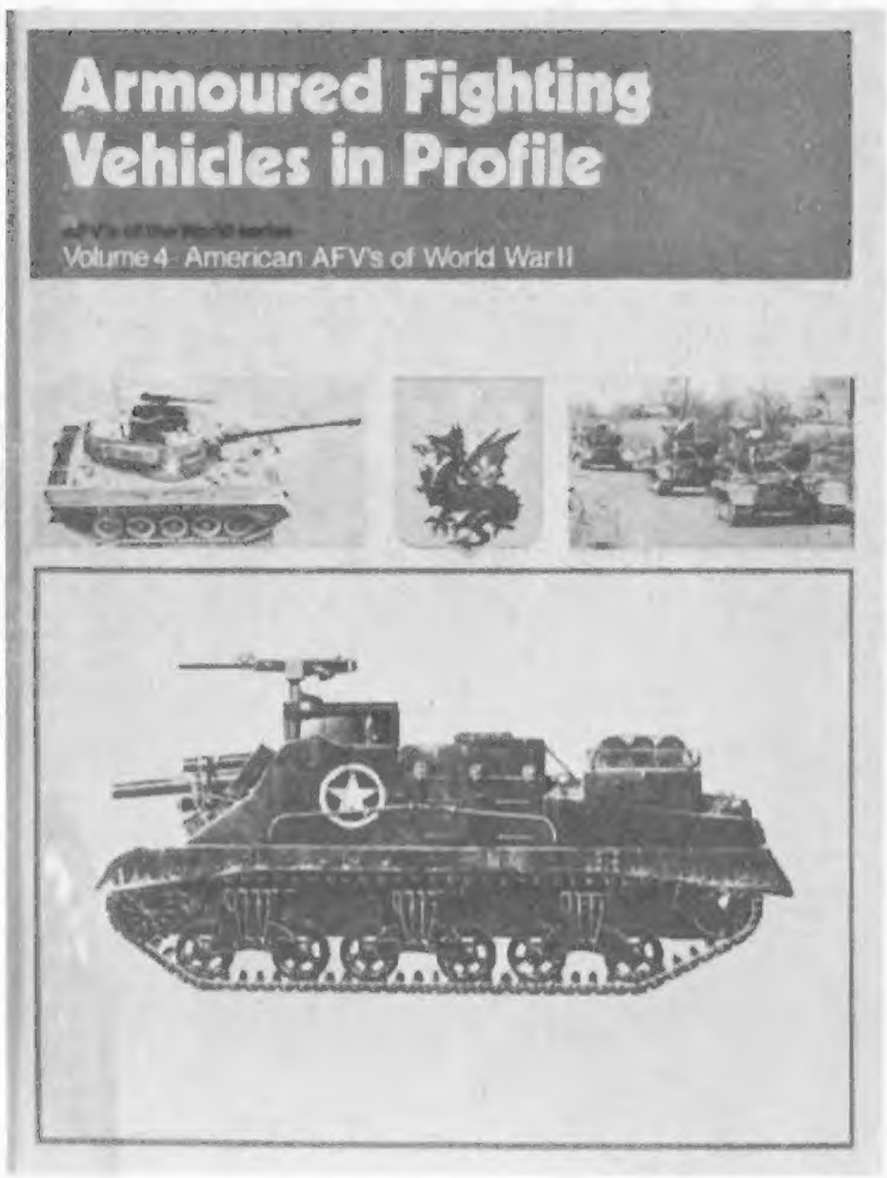

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ISBN 0 85383 003 7

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Printed in England by Edwin Snell printers Yeovil
December 1972